



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/786,070	02/26/2004	Toyoji Ito	60188-782	3918

7590 10/16/2006
Jack Q. Lever, Jr.
McDERMOTT, WILL & EMERY
600 Thirteenth Street, N.W.
Washington, DC 20005-3096

EXAMINER

PARKER, JOHN M

ART UNIT	PAPER NUMBER
----------	--------------

2823

DATE MAILED: 10/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/786,070

Applicant(s)

ITO, TOYOJI

Examiner

John M. Parker

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-30 is/are allowed.
- 6) ☒ Claim(s) 12,13,17 and 39-41 is/are rejected.
- 7) ☒ Claim(s) 14-16,18,19 and 31-38 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 16 and 17 are objected to because of the following informalities: Claims 16 and 17 recite that the wall surface of the opening has a tapered configuration, however this is no longer part of the independent claim. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 12, 13 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Yen et al. (US Pat. #5663091).

Regarding claim 12, Yen discloses a method for fabricating a semiconductor device, the method comprising the steps of:

Forming a conductive film on a specified region of a substrate [fig. 2a, 34];

Forming an insulating film on the substrate such that the conductive film is covered with the insulating film [fig. 2a, 36];

Forming, on the insulating film, a mask layer [fig. 2b, 50] having a first opening pattern above the conductive film [fig. 2b, 52];

Performing first etching with respect to the insulating film by using the mask layer having the first opening pattern to form, in the insulating film, a depressed portion having a bottom portion not reaching the conductive film [fig. 2b, 54];

Forming a mask layer having a second opening pattern having an opening diameter larger than an opening diameter of the first opening pattern by enlarging the opening diameter of the first opening pattern [fig. 2c, 56; and

Performing second etching with respect to the insulating film by using the mask layer having the second opening pattern to form, in the insulating film, an opening for exposing the conductive film, wherein a diameter of the opening increases gradually from the bottom portion toward the top portion [fig. 2d, 58]

Regarding claim 13, Yen teaches the method of claim 12, further comprising the step of:

forming, at least in the opening, a capacitor element composed of a lower electrode [fig. 2h, 34], a capacitor insulating film [fig. 2h, 46], and an upper electrode [fig. 2h, 48].

Regarding claim 17, Yen discloses the method of claim 12, further comprising, after the step of forming the opening in the insulating film, the steps of:

Forming a mask layer having a third opening pattern having an opening diameter larger than the opening diameter of the second opening pattern by enlarging the opening diameter of the second opening pattern [fig. 2e, 60]; and

Performing third etching with respect to the insulating film by using the mask layer having the third opening pattern to smooth the tapered configuration of the wall

surface of the opening [fig. 2f, 62, the third etch is a vertical etch which removes more of insulating layer 36 from all exposed portions, effectively smoothing it].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yen et al. (US Pat. #5663091) in view of Applicants admitted prior art (AAPA)

Regarding claim 39, Yen fails to specifically state that the barrier layer formed upon the lower electrode is an oxygen barrier film [column 6, lines 51 and 52]. However, AAPA discloses a semiconductor device with the use of a oxygen barrier film formed upon a conductive film [pgs. 1 and 2, lines 21-25 and 1-2 respectively].

It would have been obvious to one of ordinary skill in the art to combine the teachings of Yen and AAPA to enable the step of forming an oxygen barrier to be performed according to the teachings of AAPA. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative, suitable or useful methods of performing the disclosed method step of barrier formation. Art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 40, Yen in view of AAPA teaches the method of claim 39, wherein the oxygen barrier film consists of a titanium-aluminum nitride film, an iridium film and an iridium oxide film [pg 1, lines 23 and 24].

Regarding claim 41, Yen fails to disclose that the metal below the barrier layer is a plug formed in an insulating layer. However, AAPA teaches the use of a plug to contact the substrate covered by a barrier film [pg. 1, lines 21 and 22].

It would have been obvious to one of ordinary skill in the art to combine the teachings of Yen and AAPA to enable the process of forming a first insulating film, forming a plug to connect to the substrate and forming the conductive film on the first insulating film and connecting to the plug to be performed according to the teachings of AAPA. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative, suitable or useful methods of performing the disclosed method step of conductive plug formation. Art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Response to Arguments

Applicant's arguments with respect to claims 12,13 and 17 have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

Claims 20-30 are allowed over the prior art of record.

Claims 14-16,18,19 and 31-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

Regarding claims 14,31-38, the prior art does not teach or suggest the formation of a gradually increasing opening requiring multiple etching steps in which the lower electrode of a capacitor is upon the walls of the opening as well as the bottom.

Regarding claim 15, the prior art does not disclose or suggest forming the wall surface of the first opening pattern into a tapered configuration

Regarding claims 16 and 18-30, the reasons for allowance are stated in the office action dated 3 April 2006

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Parker whose telephone number is 571-272-8794. The examiner can normally be reached on Monday - Friday 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2823

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



John M. Parker



GEORGE R. FOURSON
PRIMARY EXAMINER